

P A T E N T   C L A I M S

1.A method of treating waste matter from animals, the method comprising:

- 5           a) collecting waste matter from the animals;  
          b) inhibiting urease activity in said collected waste matter; and  
          c) separating said urease-activity inhibited waste matter into a urea-rich fraction and a urea-lean fraction.

10           2. The method according to claim 1 wherein said inhibition comprises: reversible inhibiting urease activity, irreversibly inhibiting urease activity, and/or a combination thereof.

15           3. A method according to claims 1 or 2 wherein said inhibition comprises reversible inhibiting urease activity of said collected waste matter before said separation of said urease-activity inhibited waste matter into a urea-rich fraction and a urea-lean fraction.

20           4. A method according to claim 2 or 3 wherein said inhibition comprises a reversible inhibition of urease activity comprising treating said collected waste matter, said urea-rich fraction, or both, by a method comprising: decreasing and/or increasing pH;  
25           buffering pH; decreasing and/or increasing temperature; decreasing and/or increasing pressure; decreasing and/or increasing ionic strength, or a combination thereof.

30           5. A method according to any one of claim 1-4 wherein said inhibition comprises a irreversible inhibition of urease activity comprising treating said collected waste matter, said urea-rich fraction, or

both, with an irreversible inhibitor, said inhibitor being selected among the group comprising:

urea compounds such as hydroxyurea, seleno-urea, phenylurea, thiourea;

5 hydroxamates such as amino acid hydroxamates, acetohydroxamate;

benzoates such as p-substituted mercuribenzoate, p-chloromercuribenzoate, p-hydroxymmercuribenzoate, iodosobenzoate;

10 sulfonates such as p-chloromercuribenzene-sulfonate;

imides such as N-ethylmaleimide;

phosphor compounds such as phosphoramidate, phosphate;

15 monovalent ions such as  $F^-$ ,  $Na^+$ , and  $K^+$ ;

divalent metal ions such as  $Hg^{2+}$ ,  $Cu^{2+}$ ,  $Fe^{2+}$ ,  $Co^{2+}$ ,  $Zn^{2+}$ ,  $Ni^{2+}$ ,  $Mn^{2+}$ ,  $Cd^{2+}$ ,  $Ag^+$ ,  $Mg^{2+}$  (weak),  $Ba^{2+}$ , preferably  $Cu^{2+}$ ,  $Ag^+$ , or  $Pb^{2+}$ , or a combination thereof in form of at least one water-soluble salt, and/or at least one electrochemically-released ion;

20 trivalent ions such as  $As^{3+}$ ; and

at least one nickel-complexing agent, preferably dimethylglyoxime, ethylenediamine, EDTA, or a combination thereof, and

25 other compounds such as beta-mercaptoethanol, iodine, suramin, phenylsulfinate, and furacin.

6. A method according to any one of claims 1-5 said method comprising:

30 a) reversibly inhibiting urease activity in said collected waste matter;

b) separating said reversibly urease-activity inhibited waste matter into a urea-rich fraction and a urea-lean fraction; and

c) irreversibly inhibiting urease activity in said urea-rich fraction.

7. A method according to any one of claims 1-6 wherein said urea-lean fraction is in form of a liquid, a solid, or a combination thereof, or in form of a dried solid.

8. A method according to any one of claims 2-7 wherein said irreversible inhibitor is recovered from said irreversibly urease-activity inhibited and separated urea-rich fraction.

9. A method according to any one of claims 1-8 wherein said waste-matter comprises faeces and liquid manure from farm animals.

10. A system for treating waste matter from animals, the system comprising:

- i) a waste-matter collection means, said collection means being adapted to collect waste matter from the animals;
- j) at least one separating means, said separating means being adapted to separate said collected waste matter into a urea-rich fraction and a urea-lean fraction; and
- k) at least one urease-inhibitor supply means; said supply means being adapted to supply at least one urease inhibitor to said collected waste-matter, said urea-lean fraction, and/or said urea-rich fraction.

11. The system according to claim 10 wherein said waste-matter collecting means comprises a floor of a stable.

12. A system according to claim 10 or 11 further comprising a waste-matter storage container,

said waste-matter storage container being adapted for storing said waste matter.

13. A system according to any one of claims 10-12 wherein said at least one separation means comprises a sedimentation container, preferably a centrifuge.

14. A system according to any one of claims 10-13 further comprising a urea-rich fraction storage container, said storage container being adapted for storing said urea-rich fraction.

15. A system according to any one of claims 10-14 wherein said waste-matter collecting means comprises a flushing means for flushing said waste matter.

16. A system according to any one of claims 10-15 wherein said at least one urease-inhibitor supply means is adapted to supply said at least one urease inhibitor to said stable floor, to said waste matter storage container, to said sedimentation container, to said flushing means, or a combination thereof.

17. A system according to any one of claims 10-17 wherein at least one urease-inhibitor supply means comprises means for recirculation of recovered inhibitor.

18. A system according to any one of claims 10-17 wherein said waste-matter comprises faeces and liquid manure from farm animals.

19. A urea-lean biogas fuel product, the product comprising a urea-lean fraction of waste matter from animals wherein the waste matter has been treated by a method as defined in claims 1-9, or

wherein the waste matter has been treated in a waste-matter treatment system as defined in claims 10-18.

20. The product according to claim 19 wherein the urea-lean fraction exhibits substantially no urea.

21. A urea-rich animal waste-matter product, the product comprising urea produced from a urea-rich fraction of waste matter from animals wherein the waste matter has been treated by a method as defined in claims 1-9, or wherein the waste matter has been treated in a waste-matter treatment system as defined in claims 10-18.

22. The product according to claim 21 wherein said urea-rich fraction exhibits substantially no urease activity, preferably less than 50 unit/ml, more preferred less than 20 unit/ml, most preferred less than 5 unit/ml.

23. A product according to claims 21 or 22 wherein said urea-rich fraction exhibits minor residues of irreversibly urease-activity inhibitors.

24. A product according to claims 21-23, the product comprising animal waste-matter indicators, preferably  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{PO}_4^{2-}$ , bilirubin, albumin, uric acid in ranges 200 mmol/l to 5  $\mu\text{mol/l}$ .

25. A method of controlling the content of nitrogen in manure from animals wherein the manure is treated by a method as defined in claims 1-9, or wherein the manure is treated in a waste-matter treatment system as defined in claims 10-18.

26. A method of reducing gaseous ammonia in

stables for animals, the method comprising controlling the content of nitrogen in manure from the animals by a method as defined in claim 25.

5           27. A stable for animals, the stable comprising a waste-matter treatment system as defined in claims 10-18 for treating manure from the animals.

10           28. A biogas reactor system for producing biogas from waste matter from animals, the system comprising a waste-matter treatment system as defined in claims 10-18.

15           29. A method of producing urea from waste matter of animals, the method comprising:

a) producing a urea-rich fraction of the waste matter from the animals by a method comprising:

20           i. collecting waste matter from the animals;  
ii. inhibiting urease activity in said collected waste matter; and

iii. separating said urease-activity inhibited waste matter into a urea-rich fraction and a urea-lean fraction; and

25           b) separating urea from said urea-rich fraction.

30           30. The method according to claim 29 wherein said waste matter comprises faeces and liquid manure from farm animals.

30           31. A method of producing urea formaldehyde, the method comprising:

a) producing urea from waste matter from animals as defined in claims 29-30; and

b) reacting said urea with methanal.

32. A method of producing biogas fuel from waste matter of animals, the method comprising:

5 a) producing a urea-lean fraction of the waste matter from the animals by a method comprising:

i. collecting waste matter from the animals;

ii. inhibiting urease activity in said collected waste matter; and

10 iii. separating said urease-activity inhibited waste matter into a urea-rich fraction and a urea-lean fraction; and

b) optionally drying said urea-lean fraction.

15 33. The method according to claim 32 wherein said waste matter comprises faeces and liquid manure from farm animals.